US005953883A

United States Patent [19]

Ojala

[11] Patent Number: 5,953,883

[45] Date of Patent: Sep. 21, 1999

[54] **INSULATED WALL PANEL**

[76] Inventor: **Leo V. Ojala**, 163 Zerah Fiske Rd., Shelburne Falls, Mass. 01370

[21] Appl. No.: **08/985,517**

[22] Filed: **Dec. 5, 1997**

[51] **Int. Cl.**[6] **E04B 1/88**; E04C 2/36; E04C 2/52

[52] **U.S. Cl.** **52/794.1**; 52/220.1; 52/268; 52/270; 52/309.11; 52/407.3; 52/481.1

[58] **Field of Search** 52/220.1, 267, 52/270, 309.9, 309.11, 309.14, 404.1, 404.3, 481.1, 794.1, 795.1, 265, 268, 269, 407.1, 407.3, 741.4, 742.13, 742.12

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,305,986	2/1967	Mathews	52/794.1 X
4,068,434	1/1978	Day et al.	52/309.11 X
4,224,774	9/1980	Petersen	52/309.14 X
4,471,591	9/1984	Jamison	52/309.9
4,488,390	12/1984	Mulford	52/407.1
4,641,468	2/1987	Slater	52/309.9 X
4,658,557	4/1987	Mulford	52/407.1
4,674,253	6/1987	Young	52/794.1 X
4,702,058	10/1987	Bennett	52/309.11 X
4,765,105	8/1988	Tissington et al.	52/309.11
4,852,314	8/1989	Moore, Jr. .	
5,067,296	11/1991	Brown et al.	52/794.1 X
5,297,369	3/1994	Dickinson	52/404.3 X
5,433,050	7/1995	Wilson et al. .	
5,473,847	12/1995	Crookston .	
5,493,837	2/1996	Hepler .	
5,617,687	4/1997	Bussey, Jr. et al. .	
5,617,693	4/1997	Hefner	52/265 X
5,765,330	6/1998	Richard	52/270 X

OTHER PUBLICATIONS

Resource Conservation Technology, Inc., *Specification Sheet,* Mar. 1992.

Resource Conservation Technology, Inc., *Specification Sheet,* Sep. 1990.

Primary Examiner—Michael Safavi

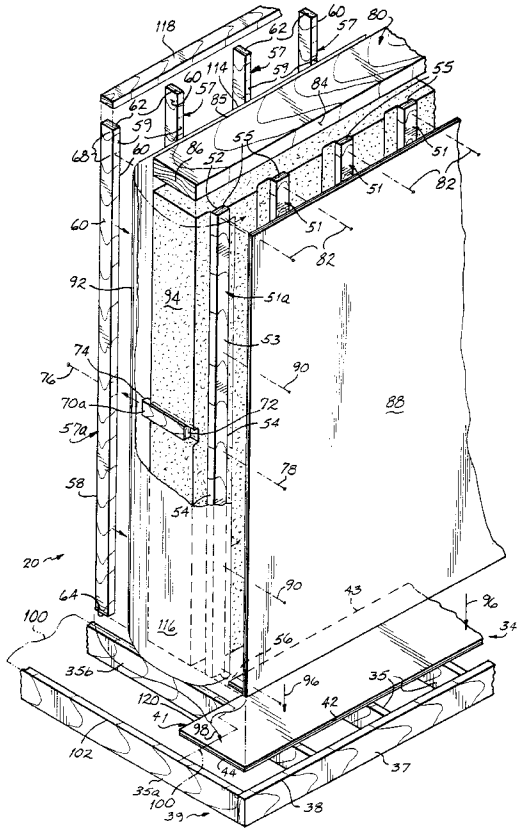
Assistant Examiner—Kevin D. Wilkens

Attorney, Agent, or Firm—Wood, Herron & Evans, L.L.P.

[57] **ABSTRACT**

An insulated wall panel comprising a bottom, a plurality of inner members, a plurality of outer members, spacers between the inner members and the outer members, an insulation layer, an exterior sheathing, a vapor barrier, a top member and a planar interior wall. The insulated wall panel has a dead air space located just inside of a cavity filled with insulation. The wall panel is adapted to be secured to the frame of a timber frame home without fasteners passing through the entire depth of the panel. Fasteners secure the inner members of the panel only to the frame without destroying the integrity of the insulated wall panel.

22 Claims, 4 Drawing Sheets



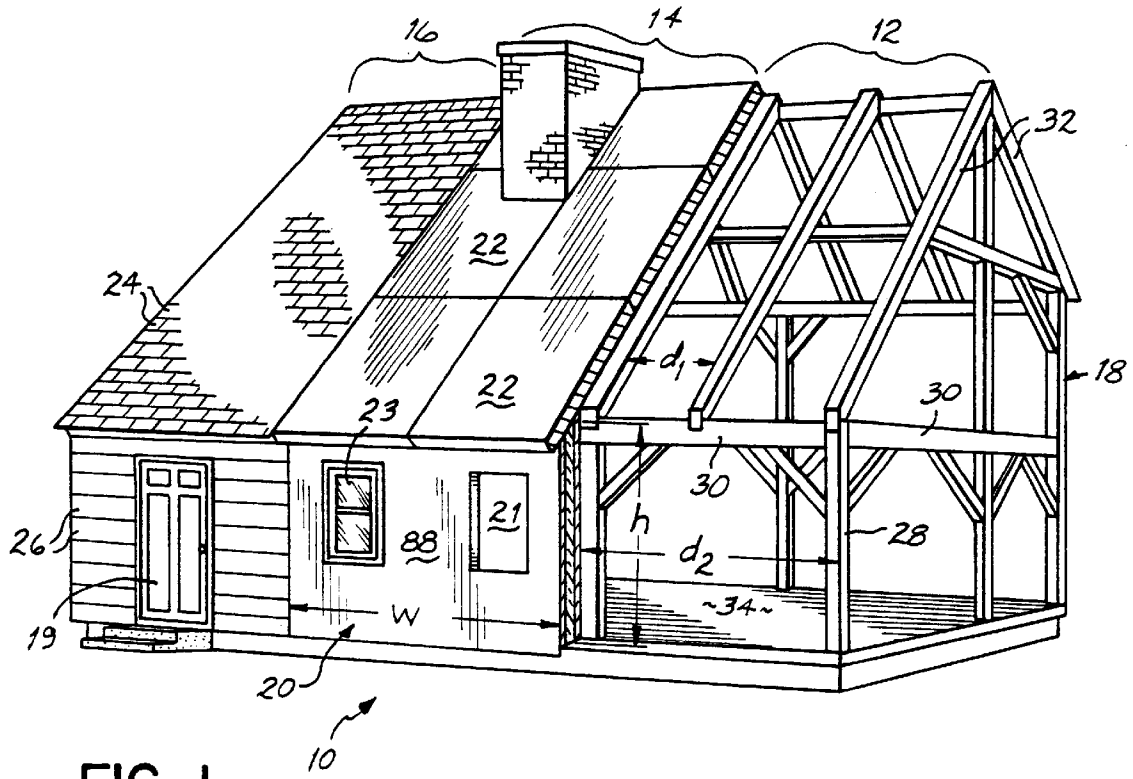


FIG. 1

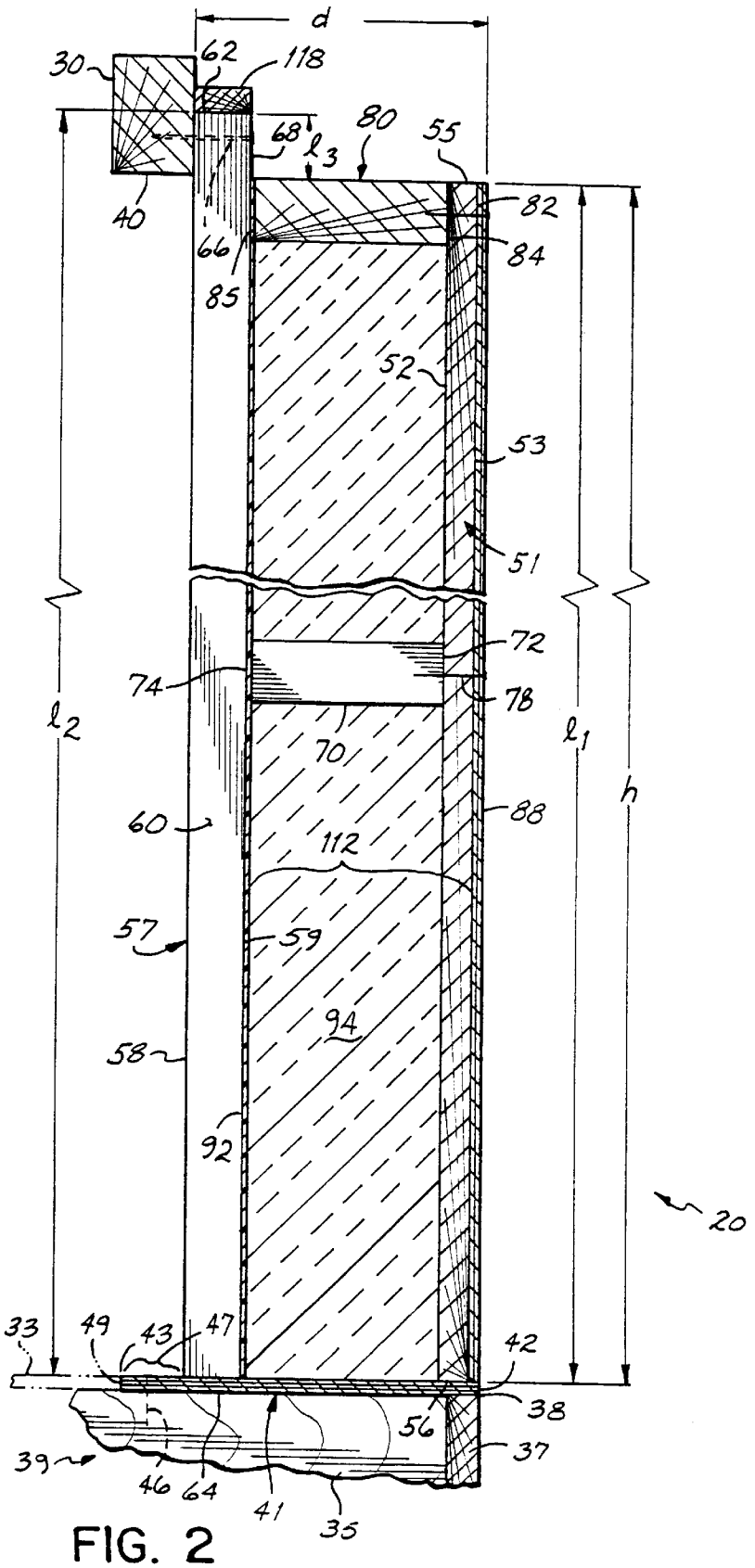

d
30
62
118
68
ℓ_3
80
55
40
82
66
84
85
52
53
51
72
74
78
ℓ_2
70
ℓ_1
h
60
88
112
57
59
94
58
92
20
33
49
43
47
42
38
56
39
37
46
64
41
35

FIG. 2

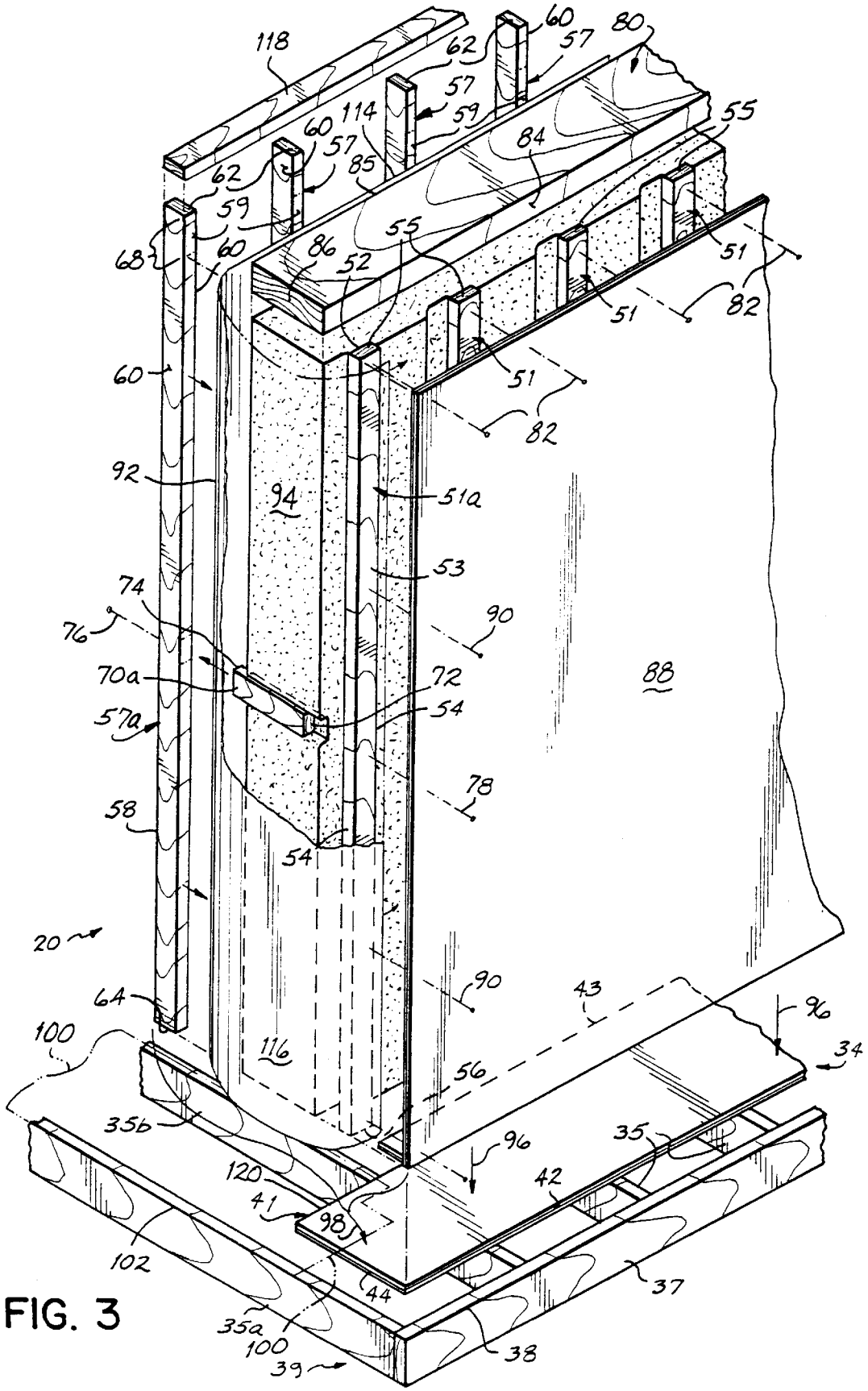

118
62
60
57
80
57
59
114
55
84
85
68
86
52
51
82
92
94
51a
53
74
76
90
70a
72
88
57a
54
78
58
20
64
100
116
43
96
34
56
35b
35
120
42
41
98
102
44
37
35a
38
39

FIG. 3

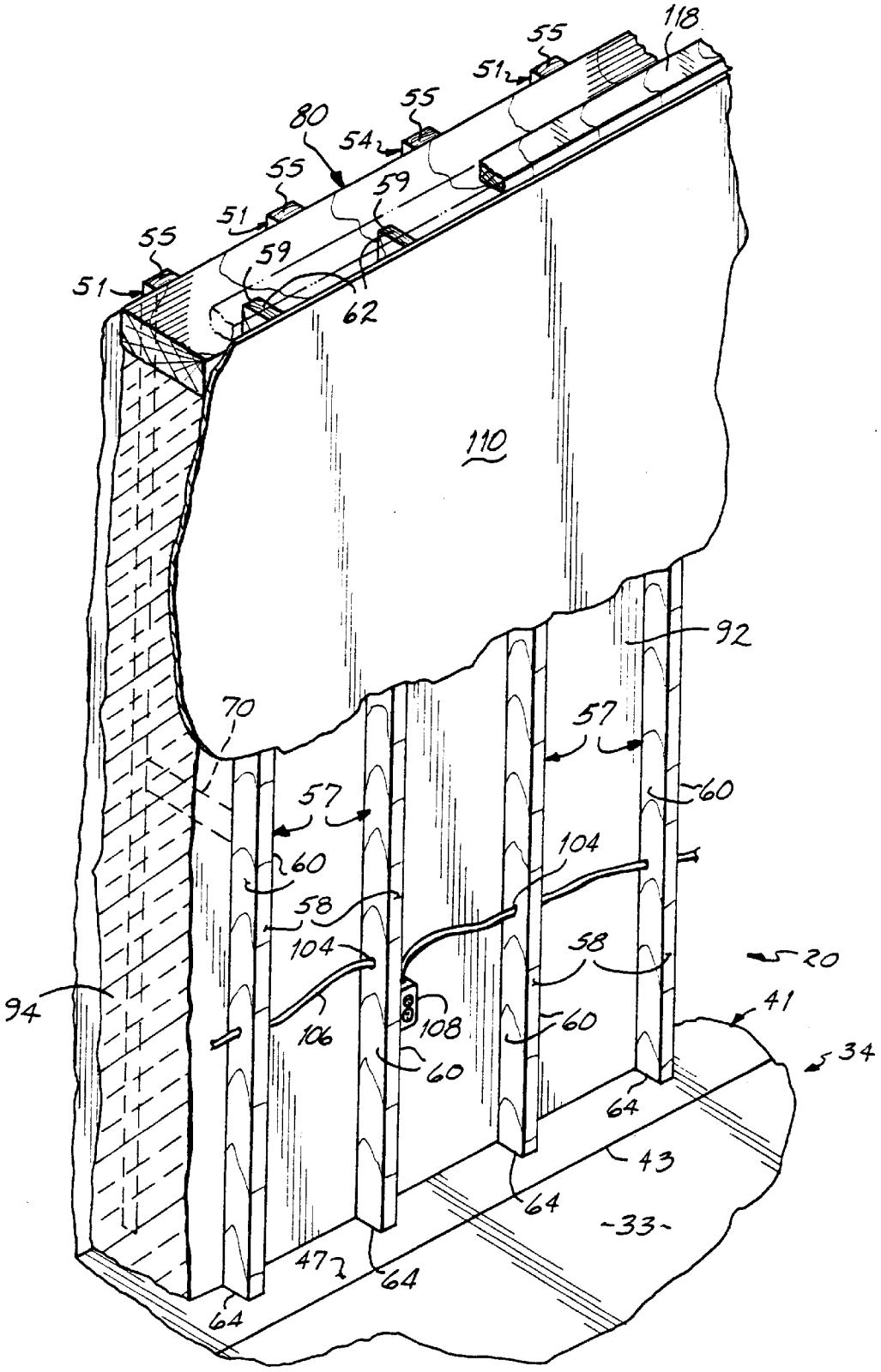

118
55
51
55
80
54
55
59
51
55
59
51
62
110
92
70
57
57
60
104
60
58
104
58
20
94
41
106
108
60
60
34
64
43
64
-33-
47
64
64

FIG. 4

INSULATED WALL PANEL

FIELD OF THE INVENTION

This invention relates to the manufacture and construction of building panels for residential, light commercial and commercial building construction.

BACKGROUND OF THE INVENTION

One popular type of home is what is considered in the construction industry a timber frame home. Timber frame homes are constructed of a plurality of heavy timber frame members and are designed so as to expose the timbers of the frame inside the home.

Traditionally a conventional light frame was built around or between the timbers filled with fiberglass insulation, covered on the inside with drywall and on the outside with siding. However, this method was slow, labor intensive and costly. In addition, it was not energy efficient because the insulation was interrupted every 16 inches by a stud or rafter allowing heat to easily escape and cold to enter at these points.

In the 1970's, structural insulating panels, commonly known in the industry as stress-skin panels, were developed for use in the residential construction of timber frame homes. The stress-skin panels were nailed to the exterior of the frame members leaving the frame exposed inside the home, thus creating an attractive appearance. These stress-skin panels used in conjunction with a timber frame replaced in many applications the standard 2×4 construction of homes. The stress-skin panels were considered stronger than 2×4s and were considered to provide better insulating capability.

A stress-skin panel is a panel comprising an outer skin, an inner skin and several inches of rigid foam insulation sandwiched between the two layers of sturdy sheathing material or skins. The outer and inner skins are usually made of plywood, waferboard or oriented strand board (OSB). Both plywood and OSB are commercially available only in certain size sheets. For example, plywood is typically available in 4'×8' sheets while OSB is typically available in larger size sheets (up to 8'×24'). The foam insulation core located between the two skins is expanded polystyrene (commonly called EPS) or urethane foam, typically 3½" thick. These panels are typically prefabricated before being installed as part of the walls or roofs of structures like homes, commercial offices, etc.

The stress-skin panels may be manufactured by injecting a liquid urethane between the two skins and allowing the liquid urethane to expand between the skins, the urethane foam adhering to the inner surfaces of the skins without any other adhesives. Alternatively, the foam insulation may be glued or adhesively secured to the outer sheathing layers or skins. However, over time the adhesive used to secure the foam insulation to the two skins may deteriorate if exposed to extreme temperature fluctuations causing the inner and outer skins to sheer apart from the foam insulation.

These stress-skin panels are secured to the heavy timber frame of a structure with long nails or screws known in the industry as pole, barn spikes or deck screws. The length of these nails or screws must be greater than the depth of the stress-skin panels so that the panels may be secured to the exterior surfaces of the timber frame of the structure, the nails or screws passing through the entire stress-skin panel and into the timber frame members.

Stress-skin panels are heavy, restricting the size of the panels. Therefore in order to construct the exterior of a building a large number of panels are required to be affixed to the timber frame of the building. Due to the weight of the stress-skin panels usually the use of a crane is required to lift the panels into place. This requires a great deal of time and manpower and is therefore relatively expensive.

In addition, some type of sealant must be inserted along the joints between adjacent stress-skin panels in order to reduce air and moisture flow through these joints. Alternatively, thin horizontal splines may be used between panels to minimize thermal breaks. Improperly sealed joints or seams can allow moisture to collect and the trapped moisture can eventually cause the materials of the stress-skin panels to swell and deteriorate.

Another drawback to the use of stress-skin panels is that in order to pass electrical wires through the panels, a hollow cardboard tube must be built into the foam insulation layer of the panels in order to create a passageway for the wires to pass through. These tubes passing through the insulation layer of the stress-skin panels reduce the insulating capability of the panels. Additionally, if an electrical outlet is to be located in the stress-skin panel, a portion of foam insulation and a portion of the inner skin must be removed in order to create a place for a conventional electrical box.

In cold climates where a large temperature differential exists between the exterior surface of panels and the interior of the structure, the nails or screws running through the panels may conduct heat and may cause condensation at the heads of the nails or screws. Over time, this condensation may cause the exterior layer of the stress-skin panels to rot which may eventually cause structural failure of the panels.

In addition, utilizing stress-skin panels is expensive. Because the interior layers or skins of the stress-skin panels are usually plywood, another layer of material such as drywall or wood paneling must be placed over and attached to the inner layer of the stress-skin panels to form the inner wall of the home. Similarly, a layer of siding or other material must be placed over the outer skins of the stress-skin panels.

In light of the aforementioned drawbacks of stress-skin panels, a need exists for a panel which is structurally sounder than current stress-skin panels and will not deteriorate or degrade over time due to seasonal temperature fluctuations. A need also exists for a panel which may be made of differing sizes so that an entire wall may be constructed of one panel rather than several pieces of panel. Also a need exists for a panel which does not require the use of long fasteners or nails which pass all the way through the panel in order to secure the panel to a timber frame.

Therefore, it has been one objective of the present invention to provide an insulated wall panel less susceptible to degradation over time than stress-skin panels.

It has a further objective of the present invention to provide an insulated wall panel which does not require long screws or nails to pass through the panel in order to secure the panel to a timber frame of a building.

It has been a further objective of the present invention to provide an insulated wall panel which may be made of many different sizes including the size of one entire wall.

SUMMARY OF THE INVENTION

The invention of this application which accomplishes these objectives comprises an insulated wall panel of a fixed width, a fixed height and a fixed depth. The insulated wall panel comprises a bottom member, a plurality of spaced, parallel vertically extending outer members, a plurality of

spaced, parallel vertically extending inner members, a plurality of spacers between the inner and outer members, an exterior sheathing, a vapor barrier, insulation, a top member and a planar interior wall. The bottom member of the insulated wall panel of the present invention comprises one or more pieces of plywood extending the width of the panel. However, the depth of the bottom member of the wall panel is greater than the depth of the insulated wall panel. In other words, a portion of the bottom of the wall panel extends inwardly beyond the interior wall of the wall panel so that the bottom of the wall panel can be easily and conviently nailed to floor joists of the building in order to secure the wall panel in place.

Each of the outer members has an inside surface, an outside surface and two side surfaces. Each of the outer members is secured to the bottom member of the wall panel. All the outer members are approximately the same length.

Likewise, each of the inner members has an inside surface, an outside surface and two side surfaces. Each of the inner members has approximately the same length which is longer than the length of the outer members and is secured to the bottom member of the wall panel.

A plurality of spacers separate the inner and outer members. The spacers extend between the inner surfaces of the outer members and the outer surfaces of the inner members. A plurality of middle spacers including two endmost middle spacers secure each one of the outer members to a corresponding inner member in a one to one relationship. These middle spacers are located approximately half way up of the height of the insulated wall panel. Fasteners such as nails secure the middle spacers between one of the inner members and a corresponding outer member. In addition to the plurality of middle spacers, a horizontally extending top spacer extends between the inner surfaces of the outer members and the outer surfaces of the inner members. The top spacer is one piece, is secured to each of the inner members and each of the outer members and has a top surface which is generally coplanar with the top surfaces of the outer members. The top spacer provides a top to the insulated wall panel.

A planar exterior sheathing is secured to the outside surface of the outer members. This planar exterior sheathing may be one large sheet of plywood, oriented strand board, cement board, or a spun nylon barrier such as TYVEK® made by DuPont or other similar material. The planar exterior sheathing may alternatively be multiple pieces (for example, 4'×8' sheets of plywood) secured to the outer surface of the outer members. These individual pieces of exterior sheathing may be placed edge to edge so as to cover the entire outer surface of the wall panel.

A vapor barrier (typically made of plastic) is located against the outside surface of the inner members, is wrapped around the endmost or outermost middle spacers of the panel and is secured to the endmost outer members of the panel. The vapor barrier typically extends the full width and height of the insulated wall panel. This vapor barrier is typically air tight and made of a relatively strong plastic material.

The wall panel has insulation extending generally between the vapor barrier and the exterior sheathing. The insulation fills a cavity created by the bottom, the vapor barrier on the inside and sides, the exterior sheathing on the outside, and the top spacer on the top. The insulation goes around the middle spacers.

An upper portion of each of the inner members is secured to a top member which may be one piece laid flat on the top surfaces of the inner members or, alternatively, may be multiple pieces extending between adjacent upper portions of adjacent inner members. The function of this top member is to prevent air from escaping out the top of a dead air space created when the interior wall is placed on the inside of the insulated wall panel.

The last component of the insulated wall panel is a planar interior wall adapted to be secured to the inside surfaces of the inner members such that a dead air space is created between the bottom member, the top member, the vapor barrier and the interior wall. The planar interior wall may be gypsum wall board or plywood, milled boards or any other type of material which the home owner desires to have on the inside walls of the home.

The insulated wall panel may be sold to a home owner without the interior wall secured to the inside surface of the inner members. The insulated wall panel of the present invention enables a home owner to electrically wire the home without disturbing the insulation. Before the interior wall is secured to the inner members of the insulated wall panels, the home owner or electrical contractor may drill holes through the inner members of the insulated wall panels and pass electrical wires through these holes without disturbing the insulation located between the vapor barrier and the exterior sheathing (the remainder of the insulated wall panel). Once the house is electrically wired, the interior wall may be secured to the inside surfaces of the inner members creating a dead air space between the bottom member of the wall panel, the vapor barrier, the top member and the interior wall. This dead air space functions as a further insulation layer in addition to the insulation located in the cavity described hereinabove. In this manner, a house may be wired without having to puncture the vapor barrier and disturb the interior of the insulated wall panel.

The inner members are longer than the outer members so as to enable the insulated wall panel to be secured to a horizontal beam of a timber frame without disturbing the interior of the insulated wall panel and, more particularly, without any fastener passing through the entire depth of the insulated wall panel as has been done heretofore. Rather, with the present invention, the fasteners need only go through the top portions of the inner members. Therefore the insulated cavity between the vapor barrier and the exterior sheathing is undisturbed and has no fasteners passing therethrough. In this way, heat may not be conducted through the insulated wall panel through the fasteners and the wall panel is apt to last longer than heretofore known wall panels.

There and other objectives and advantages of the present invention will be even more readily apparent from the following detailed description of the drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a home built using heavy timber frame construction divided into thirds, one third illustrating the timber frame itself, a second third illustrating the insulated wall panel of the present invention secured to the timber frame and the remaining third illustrating a finished home;

FIG. **2** is a cross-sectional elevational view of the insulated wall panel of the present invention secured to a horizontal beam or member of a timber frame;

FIG. **3** is an exploded perspective view of the insulated wall panel of the present invention without the interior wall being secured to the insulated wall panel; and

FIG. **4** is a perspective view of the insulated wall panel of the present invention with the interior wall secured to the inner members of the insulated wall panel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, and particularly to FIG. **1**, there is illustrated a conventional timber frame home **10**. For illustration purposes, the home is divided into thirds: a first third **12**, a second third **14** and a last third **16** illustrating the progression of a home during construction of the home. The first third of the home **12** (seen in FIG. **1** as the rightmost third of the home) illustrates the frame **18** of a conventional timber frame home. The second third **14** (the middle third as seen in FIG. **1**) illustrates the insulated wall panel of the present invention **20** secured to the timber frame **18** of the home and roof panels **22** secured to the rafters **32** of the timber frame **18**. The last third **16** of the home (seen to the left in FIG. **1**) illustrates shingles **24** secured to the roof panels **22** and pieces of siding **26** secured to the exterior of the insulated wall panel **20** of the present invention. Therefore, moving from right to left in FIG. **1**, the different phases of construction of a timber frame home are illustrated to aid in the reader's understanding of the insulated wall panel of the present invention.

A timber frame home starts with a conventional wooden timber frame **18** and, more particularly, with spaced vertical timber frame members **28** which may be 6×8s or other sized lumber typical in the timber framing industry. These vertical members **28** are typically spaced apart from one another either 12, 14 or 16 feet but may be spaced apart any distance. Connecting the tops of the vertical frame members **28** are horizontal frame members **30** which go around the periphery of the home. Like the vertical frame members **28**, these horizontal frame members may be 6×8s or any other sized members sufficient to support the insulated wall panels **20** of the present invention. Lastly, the timber frame **18** of the home comprises a plurality of rafters **32** which are used to support the roof of the home and are generally built in an inverted V-shaped configuration. Typically, the distance d_1 between the rafters **32** is less than the distance d_2 between the vertical members **28** of the timber frame.

Referring to the middle third **14** of the home **10** of FIG. **1**, the insulated wall panel **20** of the present invention is secured to one of the horizontal members **30** of the timber frame and extends from the horizontal member **30** of the timber frame to the floor or supporting surface **34** of the home. As seen in FIGS. **1** and **2**, each insulated wall panel **20** has a fixed width w, a fixed height h and a fixed depth d. As best illustrated in FIG. **1**, the width w of the insulated wall panel **20** is approximately the same distance as the distance d_2, the distance between the centers of the vertical members **28** of the timber frame **18** which is typically 12, 14 or 16 feet but may be any distance. The vertical members **28** of the timber frame **18** provide further support for the insulated wall panels around the periphery of the home.

The depth d of the insulated wall panel **20** of the present invention may be any distance depending on the insulating capability or R value desired and the type of insulation used inside the panel.

The insulated wall panels **20** of the present invention are prefabricated, each being custom made for a particular home and having a predetermined length, width and depth. As illustrated in FIG. **1**, the wall panels **20** may be prefabricated with openings or holes **21** therein adapted to receive one or more windows **23** or doors **19**. In other words, the wall panel may be custom manufactured to include openings **21** for doors **19** and/or windows **23**. The holes **21** do not compromise the integrity of the insulated wall panel and do not otherwise affect the construction or composition of the insulated wall panels **20**.

The height h of the insulated wall panel **20** must be at least the distance from the supporting surface **34** to the lower edge **40** of horizontal member **30** of the timber frame **18** or greater in order to properly insulate the home **10**. The insulated wall panels **20** of the present invention are supported by and secured to floor joists **35**. As best illustrated in FIG. **3**, a floor frame **39** is made up of two outermost floor joists **35***a* (one of which is shown) and two end frame members **37** (one of which is shown). The floor joists **35** extend between the floor frame end members **37**. The endmost or outermost floor joists **35***a* form the sides of the floor frame **39**. As best seen in FIG. **2**, the wall panels **20** of the present invention are placed around the periphery of a middle portion **33** of a floor or supporting surface **34**.

Referring now to FIGS. **2–4**, the insulated wall panel **20** of the present invention will be described in detail. The insulated wall panel **20** of the present invention has a bottom member **41** which may be made of plywood or any other material. The bottom member **41** of the insulated wall panel **20** has an outer edge **42**, an inner edge **43** and two side edges **44** (one of which is shown). The bottom member **41** of the insulated wall panel **20** is the same width w as the wall panel but is of a greater depth, i.e. the distance from outer edge **42** to inner edge **43** of the bottom member **41** is greater than the depth d of the insulated wall panel (see FIG. **2**). The bottom piece **41** of the insulated wall panel **20** extends further inwardly than the remainder of the wall panel **20** so that fasteners **46** may be quickly and easily passed through a rear portion **47** of the bottom member **41** of the insulated wall panel **20** and into the floor joists **35** in order to secure the insulated wall panels **20** in place. As seen in FIG. **2**, the outermost edge **49** of the middle portion **33** of the floor or supporting surface **34** of the building abuts against the inner edge **43** of the bottom member **41** of the insulated wall panel **20** thus providing an uninterrupted coplanar floor or supporting surface **34** of the building or home.

A plurality of spaced, parallel, vertically extending outer members **51** including two endmost or outermost outer members (only one **51***a* being shown) are secured to the bottom member **41** of the wall panel **20**. These outer members **51** are typically made of wood; however, they may be made of any material and need not necessarily be wood. Likewise, these outer members **51** are typically 2×4s but may be of any size.

As best illustrated in FIG. **3**, each of these outer members **51** has an inside surface **52**, an outside surface **53** and two side surfaces **54**. The outer members **51** are oriented such that the inside and outside surfaces **52**, **53** have more surface area than the two side surfaces **54**. In other words, the outer members **51** are "laid on the flat" with the larger surface areas comprising the inside and outside surfaces **52**, **53**. Each of these outer members **51** is approximately the same length l_1 (see FIG. **2**) which is the same height as the height h of the wall panel **20** generally. Each of these outer members **51** has a top surface **55** and a bottom surface **56**. The bottom surfaces **56** of the outer members are coplanar and adapted to lay flat on the top surface of bottom member **41** of the wall panel **20**. Because the outer members **51** are the same length l_1, the top surfaces **55** of outer members **51** are coplanar as well.

The insulated wall panel **20** further comprises a plurality of spaced, parallel, vertically extending inner members **57** including two endmost or outermost inner members (only one **57***a* of which is shown) which are secured to the bottom member **41** of the insulated wall panel **20**. As seen in FIG. **3**, each of these inner members **57** has an inside surface **58**, an outside surface **59**, two side surfaces **60** which are

diametrically opposed to surfaces **58** and **59**, a top surface **62** and a bottom surface **64**. Unlike the outer members **51**, the inner members **57** are not "laid on the flat" but rather are oriented such that the inside and outside surfaces **58**, **59** generally have less surface area than the side surfaces **60** of the inner members **57**. These inner members **57** are typically made of wood but may be made of other materials. In addition, the inner members **57** are typically 2×3s but may be other sizes such as 2×4s. Each of the inner members **57** and each of the outer members **51** may be secured to the bottom member **41** with a screw or fastener (not shown).

Referring to FIG. **2**, each of these inner members **57** is of the same length l_2 which is greater than the length l_1 of the outer members **51**. The reason the length of the inner members **57** l_2 is greater than the length l_1 of the outer members **51** is so that the difference l_3 between the length l_2 of the inner members **57** and the length l_1 of the outer members **51** enables a fastener **66** to pass through an upper portion **68** of the inner members **57** and into the interior of a horizontal member **30** of the timber frame **18** without disturbing the interior of the remainder of the insulated wall panel **20** (see FIG. **2**). The top surfaces **62** of the inner members **57** are generally coplanar because the inner members **57** are all approximately the same length l_2. Likewise, the bottom surfaces **64** of the inner members **57** are also generally coplanar with each other and with the bottom surfaces **56** of the outer members **51**. Like the bottom surfaces **56** of the outer members **51**, the bottom surfaces **64** of the inner members **57** lie flat on the bottom member **41** of the wall panel **20** as best seen in FIG. **2**.

The inner and outer members **57**, **51** are spaced apart by a plurality of middle spacers **70**. Each middle spacer **70** secures one of the inner members **57** to one of the outer members **51**, as illustrated in FIG. **3**. Each spacer **70** extends between the inside surface **52** of an outer member **51** and the outside surface **59** of the corresponding inner member **57** with end surface **72** of the middle spacer **70** abutting the inside surface **52** of the outer member **51** and the end surface **74** abutting the outside surface **59** of the inner member **57**. These middle spacers **70** are located approximately half way up the height of the insulated wall panel and provide stability to the wall panel as a whole. Fasteners **76** pass through the inner members **57** and end surfaces **74** of middle spacers **70** to secure the middle spacers **70** to the inner members **57**. Likewise, fasteners **78** pass through the outer members **51** and end surfaces **72** of middle spacers **70** to secure the outer members **51** to the middle spacers **70**.

In addition to the middle spacers **70**, a top plate or spacer **80** extends between the inside surface **52** of the outer members **51** and the outside surface **59** of the inner members **57**. The top spacer **80** is a one piece member and is secured to each of the inner members **57** and each of the outer members **51** with fasteners **82**. The top spacer **80** has two side surfaces **84**, **85** which abut against the inside surface **52** of the outer members **51** and the outside surface **59** of the inner members **57** respectively. Likewise, the top spacer **80** has two end surfaces **86** which are generally coplanar with the outer side surfaces **54** of the endmost outer members **51***a* (one of which is shown) and the outer side surfaces **60** of the endmost inner members **57***a* (one of which is shown).

A planar exterior sheathing **88** is secured to the outside surfaces **53** of the outer members **51** with fasteners **82**. Thus, fasteners **82** secure the outer sheathing **88** to the outer members **51** and the outer members **51** to the top spacer **80**. In addition, extra fasteners **90** may secure the exterior sheathing **88** to the outside surfaces **53** of the outer members **51** only. This exterior sheathing **88** may be made of a rigid, non-flexible material such as plywood, oriented strand board (OSB) or cement board or made from a flexible material such as a spun nylon barrier such as TYVEK® made by DuPont but may be any other type of material. If a flexible outer sheathing **88** is used, a rigid brace such as an X-shaped aluminum member may be placed outside the flexible sheathing **88** and secured to selected outer members **51** in order to further stabilize the insulated wall panel **20**. This exterior sheathing **88** may be one piece of material which covers the entire outside surface of the wall panel or, alternatively, may be multiple pieces of exterior sheathing placed edge to edge so as to cover the entire width and height of the wall panel.

Another component of the insulated wall panel **20** of the present invention is a vapor barrier **92**. The vapor barrier **92** is located against the outside surfaces **58** of the inner members **57** of the wall panel **10**, wrapped around the endmost middle spacers **70***a* (one of which is shown) and secured to the endmost outer members **51***a* (one of which is shown). Thus, as seen in FIG. **3**, the vapor barrier **92** has a planar middle portion **114** and two end portions **116** (one of which is shown). This vapor barrier **92** is preferably made of plastic such as polyethylene and is preferably impervious to water vapor and air. One such type of vapor barrier is an 8 millimeter stabilized polyethylene called TENOARM™ manufactured by Treleborg Industries located in Stockholm, Sweden and is distributed in the United States by Resource Conservation Technology of Baltimore, Md. This vapor barrier **92** preferably extends the full height h and width w of the wall panel **20** and functions so as to create an inner barrier for a layer of insulation **94** and as an inner surface of an air pocket (not numbered) created when interior wall **110** is secured to the inner members **57** of the wall panel **20**. The vapor barrier **92** is sandwiched between the end surfaces **74** of middle spacers **70** and the outside surfaces **59** of the inner members **57** of the wall panel and between the side surface **85** of the top spacer **80** and the outside surfaces **59** of the inner members **57**. Thus, an interior cavity or pocket **112** (see FIG. **2**) is formed between the bottom **41** of the wall panel, the vapor barrier **92**, the top spacer **80**, and the outer sheathing **88**. This interior cavity **112** is filled with insulation **94** which may be cellulose insulation or conventional fiberglass insulation or any other type of insulating material. No adhesive is required to keep the insulation in the interior cavity **112** unlike stress-skin panels.

A top member **118** may be secured to the top surfaces **62** of the inner members **57** as illustrated in FIG. **3** so as to provide a top for the air cavity created when the interior wall or interior sheathing **110** is placed on the inside of the wall panel **20** as illustrated in FIG. **4**. The top member **118** may be one piece or, alternatively, multiple pieces, each piece extending between two adjacent inner members **54** as long as the top member **118** extends the full width w of the wall panel and creates a ceiling for the air pocket created when the interior wall or sheathing **110** is placed on the inside of the wall panel.

Once the insulated wall panel as described hereinabove is pre-assembled, the panel may be installed. To install a panel, the panel is moved downwardly and outwardly in a direction illustrated by arrows **96** and **98** (see FIG. **3**) so that the outer sheathing **88** of the wall panel **20** is generally coplanar in a vertical plane with the outer edge **38** of the end members **37** of the floor frame **39** (see FIGS. **2** and **3**). Fasteners **46** are then passed through the bottom member **41** of the wall panel **20** and into the floor joists **35** in order to secure the bottom of the wall panel in place. The upper portions **68** of the inner members **57** of the insulated wall panel **20** may then be

secured to one of the horizontal members **30** of the timber frame **18** (see FIG. **1**).

In order to secure a second panel (not shown) at right angles to the wall panel just installed, the second wall panel (not shown) is placed inside the phantom footprint **100** of second or corner mating wall panel (not shown) (see FIG. **3**) with outer edge **42** of the bottom piece **41** of the second panel (not shown) placed on top of the outer edge **102** of the outermost floor joist **35***a*. The bottom piece **41** of the second panel is then secured to the floor joists **35**. The top of the second panel is then secured to a horizontal member **30** of the timber frame **18** so that the two panels form a right angle at a corner of the home. The bottom piece **41** of each insulated wall panel **20** may have a rectangular cut-out portion **120**, enabling the wall panels **20** to form a right angle with no gaps between the wall panels **20**.

Once a panel is thus installed, a plurality of holes **104** may be drilled through the inner members **57** without disturbing the vapor barrier **92** as illustrated in FIG. **4**. Electrical wiring **106** may be inserted through the holes **104** and be secured to outlet boxes **108** secured to the inner members **57**. Thus, a timber frame home constructed with the insulated wall panels **20** of the present invention may be electrically wired without disturbing the insulation contained within the wall panels **20**.

Lastly, as illustrated in FIG. **4**, an interior wall or sheathing **110** may be secured to the inside surfaces **58** of the inner members **57** so as to create a dead air space between the vapor barrier **92** and the interior wall **110**. This interior wall or sheathing **110** may be plywood, gypsum wall board or any other material which the home owner desires to use on the inside of the home. The dead air space located between the vapor barrier **92** and the interior wall **110** functions as further insulation in addition to the insulation **94** inside cavity **112**. The interior walls **110** may be one piece or, alternatively, multiple pieces put together edge to edge so as to cover the entire surface area of the walls of the home.

While I have described one preferred embodiment of the present invention, persons skilled in the art may appreciate minor modifications which may be made to the present invention without departing from the spirit of the invention. Therefore, I do not intend to be limited except by the scope of the following claims:

I claim:

1. An insulated wall panel adapted to receive interior sheathing, said insulated wall panel comprising:

a bottom member,

a plurality of spaced, parallel vertically extending outer members including two endmost outer members secured to said bottom member, each of said outer members having an inside surface and an outside surface and being of a first length,

a plurality of spaced, parallel vertically extending inner members secured to said bottom member, each of said inner members having an outside surface and an inside surface and being of a second length,

exterior sheathing secured to said outside surfaces of the outer members,

a vapor barrier secured to the outside surfaces of the inner members so as to expose said inner members for purposes of passing wires through holes in said inner members before the interior sheathing is secured to the inside surfaces of said inner members,

insulation located between the vapor barrier and the exterior sheathing.

2. The insulated wall panel of claim **1** wherein said second length is greater than said first length.

3. The insulated wall panel of claim **1** wherein said insulation is non-rigid insulation.

4. The insulated wall panel of claim **1** wherein said vapor barrier is made of polyethylene.

5. The insulated wall panel of claim **1** further comprising at least one top member secured to an upper portion of each of said inner members, said at least one top member, said vapor barrier and said bottom member defining a dead air space with said interior sheathing once said interior sheathing is secured to the inside surfaces of said inner members.

6. The insulated wall panel of claim **1** wherein said inner members are of sufficient length so that fasteners may secure said inner members to a horizontal member of a timber frame without passing through said insulation.

7. An insulated wall panel adapted to receive interior sheathing said insulated wall panel comprising:

a bottom,

a plurality of spaced, parallel vertically extending outer members including two endmost outer members, each of said outer members having an inside surface and an outside surface,

a plurality of spaced, parallel vertically extending inner members, each of said inner members having an inside surface and an outside surface,

a plurality of horizontally oriented spacers extending between the inside surface of the outer members and the outside surface of the inner members,

exterior sheathing secured to the outside surface of the outer members,

a vapor barrier, said vapor barrier being secured to the outside surfaces of the inner members; and

insulation extending between said vapor barrier and said exterior sheathing

whereby wires may be passed through said inner members without disturbing said vapor barrier prior to said interior sheathing being secured to the inside surfaces of said inner members.

8. The insulated wall panel of claim **7** wherein said vapor barrier is wrapped around selected spacers and secured to the endmost outer members.

9. The insulated wall panel of claim **7** wherein said vapor barrier is polyethylene.

10. The insulated wall panel of claim **7** wherein said vapor barrier is made of plastic.

11. The insulated wall panel of claim **7** wherein each of said spacers extends between one of the outer members and one of the inner members.

12. The insulated wall panel of claim **7** wherein said inner members have holes therethrough for passage of electrical wires.

13. The insulated wall panel of claim **7** wherein said inside surfaces of said inner members are adapted to receive said interior sheathing.

14. The insulated wall panel of claim **7** wherein said outer members and said inner members are made of wood.

15. The insulated wall panel of claim **7** wherein each of said outer members is of a first length and each of said inner members is of a second length, said second length being greater than said first length.

16. The insulated wall panel of claim **15** wherein the difference between said second length and said first length is sufficient so as to enable upper portions of the inner members to be secured to a horizontal timber frame beam without disturbing the remainder of said insulated wall panel.

17. The insulated wall panel of claim 7 further comprising at least one top member secured to an upper portion of each of said inner members, said at least one top member, said bottom and said vapor barrier together with said interior sheathing once said interior sheathing is secured to the inside surfaces of said inner members defining a dead air space in order to better insulate said insulated wall panel.

18. The insulated wall panel of claim 17 wherein said horizontally oriented spacers include a top spacer and a plurality of middle spacers spaced below said top spacer.

19. An insulated wall panel adapted to receive interior sheathing, said insulated wall panel comprising:

a bottom,

a first set of spaced, parallel outer members including two outermost outer members secured to said bottom, each outer member having an inside surface and an outside surface,

a second set of spaced, parallel inner members secured to said bottom, each inner member having an inside surface and an outside surface,

a plurality of horizontally oriented spacers including two outermost spacers, said spacers extending between the inside surfaces of the outer members and the outside surfaces of the inner members, and securing said outer members to said inner members,

exterior sheathing secured to the outside surfaces of the outer members,

a vapor barrier secured to the outside surfaces of the inner members and being wrapped around the outermost spacers and secured to the outermost outer members so as to define an interior cavity with said bottom of said insulated wall panel and said exterior sheathing, said interior cavity being filled with insulation, whereby wires may be passed through holes in said inner members without disturbing said interior cavity prior to said interior sheathing being secured to the inside surfaces of said inner members.

20. The insulated wall panel of claim 19 wherein each of said inner members is of a length greater than the length of a corresponding outer member.

21. The insulated wall panel of claim 19 wherein said insulation is non-rigid insulation.

22. The insulated wall panel of claim 19 wherein said vapor barrier is airtight.

* * * * *